## **CLAIMS**

I An antenna comp	ric	C 1 11	a.
1 1. An antenna comp	TIL	211	٠,

- a substrate having first and second opposing surfaces;
- a plurality of antenna elements disposed on the first surface of said substrate;
- a ground plane disposed on the second surface of said substrate; and
- at least one surface wave control structure disposed on the first surface of said substrate
- 6 and between an adjacent pair of the plurality of antenna elements, where said at least one
- 7 surface wave control structure has a triangular cross section in a plane perpendicular to said
- 8 substrate, and an apex at a pre-determined distance above the first surface of said substrate,
- 9 wherein the apex has a pre-determined apex angle.
- 1 2. The antenna of claim 1, wherein the intersection of the at least one surface wave control
- 2 structure with the first surface of the substrate is a rectangle.
- 1 3. The antenna of claim 1 wherein the major axis of the at least one surface wave control
- 2 structure has a pre-determined orientation angle with respect to a line connecting the centroids
- 3 of the adjacent pair of the plurality of antenna elements.
- 1 4. The antenna of claim 3, wherein the orientation angle is such that the mutual coupling
- 2 between the adjacent pair of antenna elements is reduced.
- 1 5. The antenna of claim 1, wherein the apex is at a distance between 0.1 and 1.0 inches
- 2 above the substrate, and the apex angle is between 5 and 30 degrees.
- 1 6. The antenna of claim 1, wherein the plurality of antenna elements are stacked patch
- 2 antenna elements.
- 1 7. The antenna of claim 6, wherein the plurality of antenna elements corresponds to four
- 2 antenna elements disposed as a four element array, and the at least one surface wave control

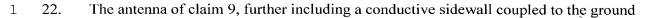
- 3 structure corresponds to two surface wave control structures that are disposed to reduce the
- 4 mutual coupling between each of the four antenna elements.
- 1 8. The antenna of claim 7 wherein the four element array and the two surface wave control
- 2 structures correspond to an antenna sub-assembly, and the antenna comprises a plurality of the
- 3 antenna sub-assemblies.
- 1 9. An antenna including one or more stacked patch assemblies, each having a first patch
- 2 element adapted to couple with an isolation structure to a second patch element, the second
- 3 patch element disposed on a first surface of a substrate, and a ground plane disposed on a
- 4 second surface of the substrate, wherein the first surface of the substrate corresponds to a
- 5 radiating surface, the antenna comprising:
  - one or more upper tuning structures having a first end in electrical contact with the first
- 7 patch element and a second end in electrical contact with the second patch element; and
- 8 one or more lower tuning structures having a first end in electrical contact with the
- 9 second patch element and a second end in electrical contact with the ground plane, wherein said
- one or more upper tuning structures and said one or more lower tuning structures are disposed
- such that the first and the second patch element can be tuned independently of each other.
  - 1 10. The antenna of claim 9, wherein the upper and lower tuning structures are conductive
  - 2 screws.

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- 1 11. The antenna of claim 9, wherein the upper and lower tuning structures are conductive
- 2 vias.
- 1 12. The antenna of claim 9, wherein at least one of the upper and lower tuning structures
- 2 comprises one or more respective conductive vias.
- 1 13. The antenna of claim 9, wherein the one or more stacked patch assemblies correspond to
- 2 four stacked patch assemblies.

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- 1 14. The antenna of claim 13, wherein the wherein the four stacked patch assemblies
- 2 corresponds to an antenna sub-assembly, and a plurality of antenna sub-assemblies comprises
- 3 an antenna array.
- 1 15. The antenna of claim 9, further comprising a first upper feed coupled to the first patch
- 2 element, where the upper tuning structures are aligned with the first upper feed.
- 1 16. The antenna of claim 15, further comprising a second upper feed coupled to the first
- 2 patch element, where the lower tuning structures are aligned with the second upper feed.
- 1 17. The antenna of claim 9, further comprising a first lower feed coupled to the second
- 2 patch element, where the lower tuning structures are aligned with first lower feed.
- 1 18. The antenna of claim 17, further comprising a second lower feed coupled to the second
- 2 patch element, where the upper tuning structures are aligned with the second lower feed.
- 1 19. The antenna of claim 9, further comprising an upper feed coupled to the first patch
- 2 element, where the upper tuning structures are aligned with the upper feed.
- 1 20. The antenna or claim 19, further comprising a lower feed coupled to the second patch
- 2 element, where the lower tuning structures are aligned with the lower feed.
- 1 21. The antenna of claim 9, wherein the first and second patch elements are provided having
- 2 one of:
- 3 a) a square shape,
- 4 b) a round shape, and
- 5 c) a rectangular shape.



- 2 plane and disposed upon the circumference of the substrate.
- 1 23. The antenna of claim 9, further including one or more combiner circuits coupled to each
- 2 respective one or more stacked patch assemblies to provide a pre-determined polarization.
- 3 polarization.